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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/593,121	06/13/2000	Sameer A. Khan	98.046	5559

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EXAMINER	
FERRIS III, FRED O	

ART UNIT	PAPER NUMBER
2128	4

DATE MAILED: 03/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application	Applicant(s)	
	09/593,121	KHAN ET AL.	
	Examiner	Art Unit	
	Fred Ferris	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Peri d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 June 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 June 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2, 3*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-28 have been presented for examination based on applicant's disclosure filed 13 June 2000. Claims 1-28 have been rejected by the examiner.

Drawings

2. Figures 1-3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specifically, per applicant's specification page 9, lines 5-29, Figure 1 discloses Delaunay meshes while Figures 2 and 3 disclose PEBI grids all of which were known in the art prior to the claimed invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,106,561 issued to Farmer (of record) in view of "Flexable Streamline Grids for Reservoir Simulation", M.G. Edwards, Stanford University – Petroleum Engineering Dept., October 1998.

Independent claim 1, for example is drawn to:
Method of scaling permeabilities with grid of cells representing porous medium by:
Generating Voronoi computational grid with cells smaller than course-scale grid (nodes)
Populating grid with permeablities of fine-scale grid
Solving flow equations, inter-node fluxes, pressure gradients from grid
Using fluxes, gradients to calculate inter-node averages
Calculating up-scaled permeabilities using average fluxes and gradients

Regarding independent claims 1, 20, and 25: Farmer discloses a method of ***scaling permeabilities*** *(CL44-L21-51) using a* ***grid of cells*** *(Fig. 13a, b) and generating a* ***Voronoi computational grid*** *(CL2-L50-CL3-L21) with* ***grid cells smaller than course-scale grids*** *(CL5-L42, CL46-L24 fine scale model into course) and related nodes (CL46-L24) using a* ***structured Areal gridder*** *(CL39-L46, CL40-L43, CL47-19). Farmer further discloses populating grids with* ***permeabilities*** *(CL44-L51) and* ***solving flow equations*** *(CL33-L58, CL39-L46: inherent to Flowgrid program), calculating* ***inter-node averages*** *(CL50-L5-30),* ***transmissibilities*** *(CL16-L22),* ***Delaunay triangulation*** *(CL14-L46-67, CL21-34), and* ***calculating up-scaled permeablities*** *(CL44-L30-67, CL45-L1-67). (Also: entire teaching, Abstract, Summary of Invention, Figs. 13d2, 16-23, 33-52, CL52-L33)*

Farmer does not explicitly teach solving flow equations representing a porous medium. (However, the examiner believes this would obviously be inherent to the "FlowGrid" program, see: CL33-L58, CL39-L46)

Edwards discloses the flexible grid FLEX simulator and ***solving flow equations*** *representing* ***porous medium.*** *(Abstract, Introduction, entire teaching, especially: Sections 2.0-2.2, 3.0-3.2, 4.0-4.2.4, 5.0-5.3, Figs. 2.1-5.14)*

It would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to modify the teachings of Farmer relating to scaling permeabilities and generating a Voronoi computational grid using a structured Areal gridder, with the teachings of Edwards relating to solving flow equations representing porous medium, to realize the claimed invention. An obvious motivation exists since this area of technology is highly competitive with many types of reservoir simulators available in the market place and large amounts of money being spent in product development and improvement. (i.e. FlowGrid, Flex, etc., see Farmer - background, Edwards - Introduction, for example) Accordingly, a skilled artisan would have made an effort to become aware of what capabilities had already been developed in the market place and, hence, would have been motivated to modify the teachings of Farmer with the teachings of Edwards in order to reduce development time and cost.

Regarding dependent claims 2-19, 21-24, and 26-28:

Per claims 2-4, 23, and 24: Farmer discloses computational grid with coarse-scale / fine-scale inter-node connections (CL5-L42, CL46-L24) and areally structured three-dimensional grids. (CL39-L46, CL40-L43, CL47-19)

Per claims 5-7, and 22: Farmer also discloses populating predetermined permeabilities by inter-node connection and harmonic averaging (CL44-L51, CL50-L5-30).

Per claims 8-11, and 21: Edwards discloses computing inter-node pressure gradients and fluxes (Section 4.1), Farmer discloses calculating inter-node averages (CL50-L5-30)

Per claims 12-17, and 26-28: Farmer discloses transmissibilities, fine-scale/coarse-scale PEBI grids and inter-node connections including Delaunay triangles as previously cited above.

Per claim 19: Edwards discloses steady state flow equations (Section 2.1)

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,078,869 issued to Gunasekera teaches reservoir simulation.

U.S. Patent 6,230,101 issued to Wallis teaches reservoir simulation.

U.S. Patent 5,710,726 issued to Rowney teaches reservoir simulation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred Ferris whose telephone number is 703-305-9670 and whose normal working hours are 8:30am to 5:00pm Monday to Friday.

Any inquiry of a general nature relating to the status of this application should be directed to the group receptionist whose telephone number is 703-305-3900.

The Official Fax Numbers are:

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March 19, 2004

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